

inlet flow conditions, dimensionless values of the flow characteristics for each location were determined, as shown in Table VI.

FIGS. 79-82 are graphs of the flow characteristics computed for the different flow conditions of Example 6. Curve-fit equations were used to describe the change in the flow

average velocity of the slurry and the Reynolds number are generally stable and decreased relative to the feed inlet conditions. As shown in FIG. 73, the slurry moves in generally a streamline fashion along the machine direction 2192 through this flow stabilization region.

TABLE VI

DIMENSIONLESS FLOW CHARACTERISTICS (K = 50)									
Geometry		Inlet Velocity = U ₁				Inlet Velocity = U ₂			
MD Distance	Hydraulic Dia.	Velocity	Shear Rate	Calc Visc.	Re	Velocity	Shear Rate	Calc Visc.	Re
3.11	0.35	0.74	1.08	0.93	0.55	0.75	1.09	0.93	0.56
4.31	0.31	0.74	1.19	0.86	0.53	0.75	1.21	0.85	0.54
5.51	0.31	0.71	1.17	0.87	0.50	0.72	1.18	0.86	0.50
6.71	0.31	0.68	1.11	0.91	0.46	0.69	1.12	0.91	0.46
7.91	0.32	0.66	1.05	0.95	0.44	0.66	1.06	0.95	0.44
8.92	0.31	0.66	1.07	0.94	0.43	0.66	1.07	0.94	0.43
9.93	0.31	0.66	1.09	0.93	0.43	0.66	1.09	0.93	0.43
10.94	0.30	0.66	1.11	0.91	0.43	0.66	1.11	0.91	0.43
11.95	0.30	0.66	1.13	0.89	0.43	0.66	1.14	0.89	0.43

characteristics over the distance between the feed inlet to the half portion 2004 of the distribution outlet 2030. Accordingly, the Examples show that the flow characteristics are consistent over variations in inlet velocity.

For both flow conditions, the average velocity was reduced from the first location (about 3D) in the feed conduit to the last location (about 12D) at the half portion 2117 of the distribution outlet 2030 of the distribution conduit 2028. The average velocity substantially progressively decreased as the slurry moved along the machine direction 2192. In the illustrated embodiment, the average velocity was reduced by about 1/3 from the inlet velocity, as shown in FIG. 79.

For both flow conditions, the shear rate increased from the first location (about 3D) in the feed conduit 2022 to the last location (about 12D) at the half portion 2117 of the distribution outlet 2030 of the distribution conduit 2028. The shear rate varied from location to location. In the illustrated embodiment, the shear rate increased at the half portion 2117 of the distribution outlet 2030 of the distribution conduit 2028 relative to the inlet, as shown in FIG. 80.

For both flow conditions, the calculated viscosity was reduced from the first location (about 3D) in the feed conduit to the last location (about 12D) at the half portion 2117 of the distribution outlet 2030 of the distribution conduit 2028. The calculated viscosity varied from location to location. In the illustrated embodiment, the calculated viscosity decreased at the half portion 2117 of the distribution outlet 2030 of the distribution conduit 2028 relative to the inlet, as shown in FIG. 81.

For both flow conditions, the Reynolds number in FIG. 82 was reduced from the first location (about 3D) in the feed conduit to the last location (about 12D) at the half portion 2117 of the distribution outlet 2030 of the distribution conduit 2028. In the illustrated embodiment, the Reynolds number decreased at half portion 2117 of the distribution outlet 2030 of the distribution conduit 2028 relative to the inlet by about 1/2. For both flow conditions, the Reynolds number at the half portion 2117 of the distribution outlet 2030 of the distribution conduit 2028 is in the laminar region.

Accordingly, it has been found that the distal half of the slurry distributor (between about 6D and about 12D) is configured to provide a flow stabilization region in which the

Example 7

In this Example, the slurry distributor 2020 of FIG. 72 was used to model the flow of gypsum slurry at the distribution outlet 2030 of the distribution conduit 2028. In this Example, the half portion 2004 of the slurry distributor of FIG. 73 was used to model the flow of gypsum slurry therethrough under flow conditions similar to those in Example 2 except using a dimensionless expression of the width of the outlet opening 2081. A dimensionless width (w/W) across the half portion 2119 of the outlet opening 2081 of the distribution outlet 2030 (with a centerline at the transverse central midpoint 2187 being equal to zero as shown in FIG. 72). The flow conditions were similar to those in Example 2 in other respects.

A CFD technique with a finite volume method was used to determine flow characteristics in the half portion 2004 of the distributor 2020. In particular, the angle of spread of the slurry discharging from the outlet opening 2081 at various locations across the width of the half portion 2119 of the outlet opening 2081 of the distribution outlet 2030 was analyzed. The angle of spread was determined using the following formula:

$$\text{angle of spread} = \tan^{-1}(V_x/V_z), \quad (\text{Eq. 9})$$

where V_x is the average velocity in the cross-machine direction and

V_z is the average velocity in the machine direction.

The angle of spread was calculated for two different conditions: one in which the profiling mechanism did not compress the outlet opening 2081 ("no profiler") and one in which the profiling mechanism compressed the outlet opening 2081 ("profiler"). In the modeled slurry distributor 2020, the outlet opening 2081 has a height of about 1/2 of an inch across its entire width of approximately ten inches for each half portion 2004, 2005, for a total of twenty inches for the total width of the outlet opening 2081. The modeled profiling mechanism has a profile member that is about 15 inches wide and is aligned with the transverse central midpoint such that a lateral portion of the distribution outlet is in offset relationship with the profiling member and is uncompressed. In the modeled "profiler" condition, the profiling mechanism compresses the outlet opening by about 1/8 of an inch such that the outlet opening is about 3/8 of an inch in the area underneath the profiling member. The angle of spread for both conditions was determined, as shown in Table VII.